

## Evaluation of commercial and field-expedient baited traps for house flies, *Musca domestica* L. (Diptera: Muscidae)

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**ABSTRACT:** A comparison of nine commercial baited fly traps on Florida dairy farms demonstrated that Terminator traps collected significantly more (13,323/trap) house flies (*Musca domestica* L.) than the others tested. Final Flight, Fly Magnet, and FliesBeGone traps collected intermediate numbers of flies (834–2,166), and relatively few were caught with ISCA, Advantage, Fermone Big Boy, Squeeze & Snap, or OakStump traps (<300). Terminator traps collected about twice as many flies (799.8/trap) as FliesBeGone traps (343.8) when each trap was baited with its respective attractant, but when the attractants were switched between the two trap types, collections were significantly lower (77–108) than was observed with traps baited with their respective attractant. Solutions of molasses were significantly more attractive to house flies than honey, maple syrup, or jaggery (date palm sugar). Field-expedient traps constructed from discarded PET water bottles were much less effective than commercial traps, but painting the tops of such traps with black spray paint resulted in a six-fold increase in trap capture. *Journal of Vector Ecology* 34 (1): 99–103. 2009.

**Keyword Index:** House fly, *Musca domestica*, trapping.

### INTRODUCTION

Traps have been a mainstay of house fly (*Musca domestica* L.) control for at least a century (Howard 1911). There is now a vast literature on attractants for house flies, perhaps originating with the description of a trap baited with fish heads, watermelon rinds, corncocks, and ice cream (Howard 1911). Much of this work has focused on identifying components of food odors that can be incorporated into lures (Frishman and Matthysse 1966, Mayer 1971, Mulla et al. 1978). Early efforts with baits relied on natural products such as fermented egg slurries (Willson and Mulla 1973) or combinations of such items as molasses, milk, yeast, grain, blood, and banana extract (Pickens et al. 1973, Pickens and Miller 1987). Brown et al. (1961) tested a range of defined chemical attractant candidates and found that combinations were superior to any individual component tested alone, and Mulla et al. (1977) reported that blends of trimethylamine, ammonia, indole, and linoleic acid were as attractive to house flies as natural food baits. These feeding attractants in general provide flies with volatile stimuli indicative of metabolism of either sugars or protein food resources. In addition to feeding attractants, flies are attracted to the pheromone (Z)-9-tricosene (muscalure) (Carlson et al. 1971, Carlson and Beroza 1973). This research has led to development of a variety of commercial traps with proprietary attractants that are available to the consumer. Most of these can be categorized as bag- or jug-style traps that are designed to hold a liquid bait. Flies enter the traps through small openings and eventually fall into the bait reservoir.

Fly control is important to U.S. military operations at home and in deployed settings, and traps provide a simple

ready-to-use tool for such control efforts. The Armed Forces Pest Management Board is charged with selecting a limited number of arthropod control products to be assigned a national stock number (NSN) by the Department of Defense central depot, allowing it to order and warehouse sufficient quantities to fill orders that meet military pest control needs. Although there are many commercially available fly traps, there is little published information on their relative efficacy (Geden 2005). At the time of this study, a single product, the FliesBeGone trap, had been assigned a NSN, in part because of the collapsible nature of the product. It is also possible to construct homemade fly traps from empty water or soda bottles. Although the instructions for making such "field-expedient" traps have been available for some time (Prendergast 2002), we are unaware of any data supporting the selection of appropriate baits for them or if the design can be improved with minor re-engineering. The objectives of the present study were to compare the relative effectiveness of commercial and field-expedient baited fly traps.

### MATERIALS AND METHODS

#### Commercial traps

Nine commercial fly traps were included in the evaluation at the request of personnel at the Navy Entomology Center of Excellence in Jacksonville, FL: 1) Terminator (Farnam Co., P.O. Box 34820, Phoenix, AZ 85067-4820); 2) Final Flight (Troy Biosciences Inc. 113 South 47<sup>th</sup> Avenue, Phoenix, AZ 85043); 3) Victor Fly Magnet (Woodstream Co. 69 N. Locust Street, Lititz, PA 17543); 4) FliesBeGone (Combined Distributors, Inc. 2505 Riverglenn Circle, Atlanta, GA 30338); 5) ISCA Ball Trap (ISCA Technologies, Inc., 2060

Table 1. Collection of house flies and blow flies over seven days on four Florida dairy farms using different commercial fly traps.

Trap type	Mean (SE) no. flies per trap	
	House flies	Blow flies
Terminator	12,323.0 (8444.8)a	81.0 (76.4)a
Final Flight	2,166.5 (1266.4)b	10.0 (7.1)b
Victor Fly Magnet	1,287.0 (471.9)b	39.5 (32.9)ab
FliesBeGone	833.8 (344.2)bc	40.3 (28.4)ab
ISCA Ball	276.8 (147.7)c	1.5 (0.9)b
Advantage	202.5 (199.8)c	5.3 (3.1)b
Fermone Big Boy	132.8 (106.7)c	1.3 (0.6)b
Squeeze & Snap	76.0 (29.6)c	2.5 (1.2)b
Oak Stump	15.5 (8.1)c	0.0 (0.0)b
ANOVA <i>F</i>	13.80**	2.42*

\*\*,  $P \leq 0.01$ ; \*,  $P \leq 0.05$ . Means within columns followed by the same letter are not significantly different at  $P=0.05$  (Tukey's method).

competing food odors.

This study was done with fresh baits that were left in the field for only seven days because previously we found that some attractants lost potency after several days in the field (Geden 2005). The instructions with several of the traps suggested that longer-term placement would result in improved collections, presumably due to fermentation or the presence of decomposing flies in the bait reservoir. An evaluation of long-term collections was beyond the scope of the present study, in which we wished to determine which traps would collect the most flies immediately after deployment to simulate a response to a fly outbreak. It may be that some of the other products have desirable properties for long-term management of relatively low fly populations.

In a follow-up study with a smaller number of trap types, Terminator traps collected about twice as many

Table 2. Collections of house flies in Terminator and FliesBeGone traps baited with their respective baits or the bait of the other product. Tests conducted on a Florida dairy farm over a two-week period.

Trap type	Bait used	Mean (SE) no. flies collected/trap
Terminator	Terminator	799.8 (145.9)a
Terminator	FliesBeGone	77.4 (29.1)c
FliesBeGone	Terminator	107.6 (37.8)c
FliesBeGone	FliesBeGone	343.8 (144.6)b
ANOVA <i>F</i> :		6.41*

\*,  $P \leq 0.05$ . Means within columns followed by the same letter are not significantly different at  $P=0.05$  (Tukey's method).

Table 3. Collections of house flies (either fed or starved) in Captivator jar traps baited with water or 25% solutions of four natural sugar products. Tests run in outdoor screen cages with 2,500 flies/cage.

Trap bait	Mean (SE) no. flies collected	
	Fed	Starved 6 h
Water control	6.7 (2.6)b	56.1 (18.8)c
Honey	18.4 (6.8)b	171.4 (31.8)ab
Jaggery	7.9 (3.1)b	141.6 (28.7)b
Maple syrup	18.5 (8.6)b	167.8 (35.3)b
Molasses	86.0 (12.0)a	561.4 (61.2)a
ANOVA <i>F</i>	8.53**	10.80**

\*\*,  $P \leq 0.01$ . Means within columns followed by the same letter are not significantly different at  $P=0.05$  (Tukey's method).

flies (799.8/trap) as FliesBeGone traps (343.8) when each trap was baited with its respective attractant (Table 2). When the attractants were switched between the two trap types, collections were significantly lower (77-108) than was observed with traps baited with their own attractant. These results were quite surprising and suggest that there is an interaction between the different attractants and the physical properties of the traps themselves.

Results of tests with different sugar baits, presented in Table 3, demonstrated that molasses was more attractive to hungry flies (561 flies/trap) than honey or maple syrup (<200 flies/trap). These results are in agreement with previous work in which molasses was shown to be highly attractive to food-seeking house flies (Geden 2005, Quinn et al. 2007). The effectiveness of molasses, along with its low cost and ready availability worldwide, makes it a good choice for field-expedient traps. Although jaggery is highly attractive to some sugar-seeking moths (Landolt 1995), it was no more attractive to house flies than honey or maple syrup in the present study.

Capture of flies that had not been starved for several hours before testing was much lower, regardless of the bait used (Table 3). This underscores one of the challenges of using baited traps in general. Because traps baited with feeding attractants can only be effective if the target fly population does not have access to high-quality food resources, sanitation remains a critical complement to their use.

Field-expedient water bottle traps baited with molasses collected very few flies (26-69 flies/trap) compared with a commercial trap using the same bait (1,692 flies/trap) in outdoor screen cages (Table 4). Similar results were obtained when traps were tested on a dairy farm (Table 4). One of the features of commercial traps is that there is almost always a cover over the trap opening(s) that functions as a light baffle to deter captured flies from using light to locate the trap opening and thus escape. Field-expedient traps made from clear plastic have no such light baffle, and this may

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